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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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FISH & RICHARDSON, PC 12390 EL CAMINO REAL SAN DIEGO, CA 92130-2081			GERSTL, SHANE F	
			ART UNIT	PAPER NUMBER
			2183	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/742,745

Applicant(s)

ROTH ET AL.

Examiner

Shane F Gerstl

Art Unit

2183

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 October 2002 and 06 December 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☒ Claim(s) 9 and 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-20 have been examined.

Papers Received

2. The drawings, information disclosure statement, and change of address papers have been received and placed on record in the file.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the static random access memory device of claim 16 and the second register of claims 9 and 16 must be shown or the features canceled from the claims. No new matter should be entered.

The figures 6 and 8, which are taken to show the invention with respect to the limitations of claims 9 and 16 must show the second register of mention in those claims.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to because figure 6 gives reference to element 34A when the specification on page 15, line 6 and figure 8 show the same reference to be element 34C. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to because figures 2, 6, 8, and 9 have functional blocks without labels. A proposed drawing correction or corrected drawings are

required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

6. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Speculative Execution of Instructions Based on a Set of Counters or an Architectural Register Used for Adjusting the Speculative Register Upon Termination of an Instruction.

7. The abstract of the disclosure is objected to because it simply gives an embodiment of the invention and not a brief overall summary. Correction is required. See MPEP § 608.01(b).

8. The disclosure is objected to because of the following informalities: there is no summary section of the specification. See 37 CFR 1.73

Appropriate correction is required.

Claim Objections

9. Claim 9 is objected to because of the following informalities: the claim's preamble defines "a apparatus" where proper grammatical form is "an apparatus" which is the interpretation the examiner is taking the phrase to mean.

10. Claim 18 is objected to because of the following informalities: the claim states, "wherein control unit" in line 1 which is improper grammatical form. An article must precede the word "control" so that its basis can be determined. The examiner is taking

the phrase to mean, "wherein the control unit," so that the control unit of the parent claims is referred to.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 15-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

13. Claim 15 recites the limitation "the instruction" in line 5. There is insufficient antecedent basis for this limitation in the claim. The examiner is interpreting the claim to say "an instruction associated with the condition" based on the specification.

14. Claim 16 recites the limitation "the instruction" in lines 11-12. There is insufficient antecedent basis for this limitation in the claim. The examiner is interpreting the claim to say "an instruction associated with the condition" based on the specification.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

16. Claims 1, 2, 4, and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Levitan (EP 0605872 A1).

17. In regard to claim 1, Levitan discloses a method comprising:
 - a. Detecting a condition in a processor; Column 4, lines 56-58, show that certain instruction occurrences (conditions) control movement of data and thus are detected.
 - b. Calculating adjustment values at stages within a pipeline. Column 4, lines 55-56, shows that the system of mention is a pipelined processor. Column 6, lines 46-49, show that a register 46 receives values that are used for adjustment as shown in column 7, lines 22-31.
 - c. Updating a register with one of the adjustment values when an instruction associated with the condition is terminated. Column 7, lines 22-31, show the case when the wrong sequence of instructions was taken after a conditional branch (BRANCH_ON_COUNT) causing an interrupt, or termination of the instruction. The section goes on to say that an adjustment value from register 46 is used to update register 42.
18. In regard to claim 2,
 - a. Levitan discloses the method of claim 1, as described above, wherein calculating the adjustment values comprises:
 - i. Incrementing the adjustment values when the condition is detected; Two detected instructions or conditions are the BRANCH_ON_COUNT and MOVE_TO_COUNT instructions. It is shown that the MOVE_TO_COUNT instruction is used only to load the update and dispatch registers with a count value (column 7, lines 5-11) so that the

BRANCH_ON_COUNT instruction can be completed (column 7, lines 35-41). Thus when the processor detects that the MOVE_TO_COUNT is finished it is also detecting that the BRANCH_ON_COUNT instruction is about to begin. When it is detected that the BRANCH_ON_COUNT instruction is going to start, register 46, which holds the adjustment values, is updated with the count just loaded into register 44 (column 7, lines 35-38). Whether this is the first loop encountered or one in a series of many, the register 46 had held the value of zero indicating the end of the previous loop. Therefore, in updating the value of this register from zero to a number of iterations, the register is being incremented by that number of iterations.

ii. decrementing the adjustment values when the instruction leaves the stages. Column 7, lines 41-46, shows that the adjustment values held in register 46, as shown above, are decremented when the BRANCH_ON_COUNT is completed (thus leaving the pipeline stages).

19. In regard to claim 4, Levitan discloses the method of claim 1, as described above, wherein detecting the condition comprises detecting an instruction within a hardware loop. The detected condition is a conditional branch (column 4, lines 56-58). Levitan shows in column 7, lines 2-3, that the branch instruction is that of a loop.

20. In regard to claim 6, Levitan discloses the method of claim 1, as described above, wherein detecting a condition comprises detecting a watch point. A watch point is set up to detect a condition such as a certain instruction as stated in the specification.

The processor detects whenever a certain instructions are encountered as described above. In order to detect each instruction, it is inherent that a watch point must exist for it, and thus this watch point is detected for each instruction.

21. In regard to claim 7, Levitan discloses the method of claim 1, as described above, wherein updating the register with one of the adjustment values comprises adjusting the register by an amount determined by a counter residing in the stage where the termination occurred. Column 7, lines 41-46, shows that the adjustment values held in register 46, as shown above, are decremented (by down counter 64 of figure 3) when the `BRANCH_ON_COUNT` is completed (thus leaving the pipeline and terminating). Because the adjustment happens upon termination, the two functions are synonymously linked and must happen in the same stage where such a branch termination can be detected.

22. In regard to claim 8, Levitan discloses the method of claim 1, as described above, wherein updating the register comprises updating a speculative register. The register updated is register 42 as shown above. This register is a speculative register because the register (44) that controls its count (column 6, lines 49-53) is a speculative register because it corresponds to the count for an instruction speculatively executed as shown in column 6, lines 46-49, thus making register 42 also speculative.

23. Claims 9-13 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Gaertner (5,996,063).

24. In regard to claim 9, Gaertner discloses an apparatus comprising:

- a. A first register; Column 13, lines 49-50, disclose two counters, R0/R1 and I0/I1. Column 13, lines 20-27, show that a rename instance is a register and thus, the R0/R1 counter, which is a rename instance, is also a register.
 - b. A second register; Column 11, lines 4-12, speak of a register file array where I0/I1 is a column in it and thus a register.
 - c. a set of counters to monitor the difference between the first register and the second register. It is well known that a set consists of one or more like elements. Column 13, lines 47-50, disclose a counter, or set of counters, U0/U1 that represents the difference between the two aforementioned counters, or registers.
25. In regard to claim 10, Gaertner discloses the apparatus as in claim 9, as described above, wherein the first register is a speculative register and the second register is an architectural register. Column 11, lines 4-10, shows that the second register stores pointers to architected register values and thus is architectural. As shown above, the first register holds a rename instance and thus is a rename register. It is well known in the art that renamed registers identify a new instance of a physical register so that its value can be used for execution ahead of time, or for speculation. Thus the rename register is speculative.
26. In regard to claim 11, Gaertner discloses the apparatus as in claim 10, as described above, wherein the first register is a speculative count register and the second register is an architectural count register. As described above, the registers are also counters and thus are count registers.

27. In regard to claim 12, Gaertner discloses the apparatus as in claim 9, as described above, wherein the first register, second register and set of counters reside in a multi-stage pipeline (figure 3) controlled by a control unit, and the set of counters include counters maintained at a stage where the first register resides and at stages after the stage where the first register resides; It is inherent that the pipelined processor has a control unit to control it. The first register resides in the register renaming and allocation stage of figure 3 because the R0/R1 register is a part of the allocator (figure 7). Since the first register keeps track of pointers to the rename registers, as shown above, it is accessed or updated whenever these registers are accessed. Thus the counter U0/U1 which also resides in the allocator (figure 7) is maintained at these times. As can be seen from figure 3, there is the register renaming and allocation stage and three execution units and a reorder buffer in stages afterwards where the registers are accessed. Thus the set of counters U0/U1 are maintained where the first register resides and at stages after this stage.

28. In regard to claim 13, Gaertner has disclosed the apparatus as in claim 12, as described above, wherein the set of counters consist of counters residing in stages before an n^{th} stage of a pipeline, and wherein n defines a point at which allowing instructions to flow through the pipeline takes an amount of time less than or equal to a branch penalty. It is well known in the art that a branch penalty is the number of cycles equal to the number of discarded instructions that are behind a branch instruction in the pipeline. The time to drain is taken to be the number of cycles from point n before the instructions thereafter are out of the pipeline. Figure 3 shows that based on the flow

diagram, the register renaming and allocation block where the set of counters resides, as described above, is the fifth stage. Also from the diagram one can see that the most cycles performed after this point is 4 to the data memory. Therefore, if one defines n to be the 5th stage, there are only at most 4 more stages after this point for instructions to flow, which is less than or equal to the 4 that would need to be flushed before this point for a branch penalty.

29. In regard to claim 15, Gaertner discloses the apparatus as in claim 12, wherein the control unit is adapted to:

- a. increment the counters when the first register is adjusted because of a detected condition; It is inherent that if the first register is adjusted it will be because of some detected condition. Because the set of counters $U0/U1$, is the difference between the first and second registers, as shown above, the counter is incremented if the first register is adjusted by a positive value such as in column 13, lines 39-40, where the first register is incremented.
- b. decrement a respective counter when the instruction associated with the condition leaves a respective stage of the pipeline associated with the respective counter. In column 13, lines 37-40, it is shown how the register $R0/R1$ is incremented when the register it points to is used as a target register. It is inherent that an instruction is using that register as a target. Now when that instruction is finished (or leaves a certain pipeline stage) the previous instance is no longer needed and thus is not the latest. Therefore, the first register, which keeps track of the latest rename instance as described before, will return to the

previous position by decrementing. This will cause the set of counters U0/U1 to also decrement since it keeps a difference between the first and second registers.

Claim Rejections - 35 USC § 103

30. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

31. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Levitan in view of Gschwind (6,189,088).

32. In regard to claim 3,

- a. Levitan discloses the method of claim 1, as described above.
- b. Levitan does not disclose that detecting a condition comprises detecting an access to a specified memory location.
- c. Gschwind has disclosed a speculative execution processor where in column 5, lines 41-55, the processor detects if a first load instruction loads a memory location read by a second, thus detecting an access to a specified memory location. Gschwind goes on to say that this interference must be detected so that the state of the processor can be recovered and the proper instructions re-executed. This keeps the processor from processing invalid data. Incorporating this design into Levitan to also detect the condition of when a

specified memory location is accessed would allow for the adjustment of the register when such a memory access condition was made in order to retrieve correct data.

d. The ability to detect interferences between instructions accessing a memory location would have motivated one of ordinary skill in the art to include the detection of an access to a particular memory location, as taught by Gschwind, into the design of Levitan.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the design of Levitan to include the memory access detection of Gschwind in order to be able to detect memory interferences and avoid data errors.

33. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Levitan in view of Tran (6,003,128).

34. In regard to claim 5,

a. Levitan discloses the method of claim 4, as described above, of detecting a branch.

b. Levitan does not disclose wherein detecting the instruction within the hardware loop comprises detecting a bottom match. The specification has defined a bottom match to be the last instruction of a loop.

c. Tran has taught in column 1, lines 66-67, that a loop is delimited by the loop instruction, which executes as the last instruction in the loop. Tran defines the loop instruction to consist of a decrement and a branch in the next few lines.

Therefore the loop always ends in a branch.

d. By modifying the design of Levitan to be sure that loop iterations always end in the `BRANCH_ON_COUNT` instruction, the control would be simpler because it would always be known where the end of the loop was based on the detection of one instruction.

e. This simplified control would have motivated one of ordinary skill in the art at the time of invention to be sure that the design of Levitan called for loop iterations to always end with a branch as taught by Tran.

It would have been obvious to one of ordinary skill at the time of invention to modify the design of Levitan to always end loop iterations with a branch instruction so that control is simplified.

35. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gaertner in view of Levitan.

36. In regard to claim 14,

a. Gaertner discloses the apparatus as in claim 12, as described above, wherein following a termination of an instruction in the pipeline, the control unit is adapted to adjust the first register. As shown in the summary, upon an exception, or termination, the reorder buffer and speculative registers are discarded and the in-order state is restored. This then includes the speculative first register of mention above.

b. Gaertner does not disclose that the first register is adjusted by an amount determined by a particular counter maintained in a stage where the termination occurred.

c. Levitan shows in figure 3, that register 42 is updated by counter 46 on an interrupt (termination). Column 6, lines 46-49 show that counter 46 is a counter because it holds a count value. This allows for the register to be restored immediately without having to fetch the correct data from memory or an architected register. The counter is maintained in each stage, including that where the termination occurs, so that the counter itself can be updated when needed, such as when it is decremented on completion of a branch (column 7, lines 41-46).

d. This quick restoration of the register to a correct stage would have motivated one of ordinary skill in the art to modify the design of Gaertner to include the adjustment method using a counter given by Levitan.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the design of Gaertner to use the updating method for a speculative register using a counter as given by Levitan so that the updating may take place as quickly as possible and normal execution can resume.

37. Claims 16-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levitan in view of Hennessy.

38. In regard to claim 16,

- a. Levitan discloses
 - i. A memory device (figure 1, element 18);
 - ii. A first register (figure 3, element 44);
 - iii. A second register (figure 3, element 40);

iv. A set of counters; Figure 3, elements 42 and 46, are shown to hold a count value in column 6, lines 39-49, which is later decremented, thus yielding the elements to be counters.

v. A processor coupled to the memory device (figure 1), wherein the processor includes an execution pipeline (paragraph 2, line 2) and a control unit (column 7, lines 1-2) adapted to:

(1) Increment the counters when the first register is adjusted because of a detected condition; The detected condition is the MOVE_TO_COUNT instruction. It is shown that the MOVE_TO_COUNT instruction is used to load, or adjust, the update register, 44, with a count value (column 7, lines 5-11) so that the BRANCH_ON_COUNT instruction can be completed (column 7, lines 35-41). Thus when the processor detects that the MOVE_TO_COUNT is finished it is also detecting that the BRANCH_ON_COUNT instruction is about to begin. When it is detected that the BRANCH_ON_COUNT instruction is about to start, register 46, which holds the adjustment values, is updated with the count just loaded into register 44 (column 7, lines 35-38). Whether this is the first loop encountered or one in a series of many, the register 46 had held the value of zero indicating the end of the previous loop. Therefore, in updating the value of this

register from zero to a number of iterations, the register is being incremented by that number of iterations.

(2) Decrement a respective counter when the instruction leaves a respective stage of the pipeline associated with the respective counter. As stated previously, "the instruction" is taken to mean, "an instruction associated with the condition." Since the counter register architecture is initialized by the MOVE_TO_COUNT instruction so a BRANCH_ON_COUNT instruction can execute (column 7, lines 35-41), this branch instruction is associated with the detected move instruction, which is the condition. Column 7, lines 41-46, shows that the counter 46, is decremented when the BRANCH_ON_COUNT is completed (thus leaving the pipeline stages).

- b. Levitan does not disclose that the memory device is a static random access memory device.
- c. Hennessy discloses on page 541 in the table that SRAM or static random access memory is the fastest memory technology of the technologies disclosed.
- d. The ability to access memory with an increased speed using the static random access variety as taught by Hennessy would have motivated one of ordinary skill in the art to modify the design of Levitan to use a static random access memory device.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the design of Levitan to include a static random access memory device as disclosed by Hennessy in order to be able to access needed data quickly.

39. In regard to claim 17, Levitan discloses the system of claim 16, wherein following a termination of the pipeline, the control unit is adapted to adjust the first register. Levitan discloses the case of an interrupt, a pipeline termination, in column 7, lines 22-31. It is inherent then that the speculative register (column 6, lines 46-48), 44, must also be updated after such a termination in case of an incorrect value. This incorrect value would exist if a MOVE_TO_COUNT had been executed before an interrupt that occurred before the branch was completed

40. In regard to claim 20, Levitan discloses the system of claim 17, as described above, wherein the control unit is adapted to drain unaborted instructions and write the first register with the data in the second register, if the termination occurs in a stage of the pipeline after an n^{th} stage. Column 5, lines 6-9, show that on a mispredicted branch (the interrupt or termination as stated above), the sequential instructions must be purged, or drained. Figure 3 shows that the first register, 44, is updated only by the second register, 40. Thus when the register is adjusted at a stage after an n^{th} stage, it is done so by writing the data in the second register to it.

41. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levitan in view of Hennessy as applied to claims 16-17 and 20 above, and further in view of Nakada (5,638,526).

42. In regard to claim 18,

- a. Levitan discloses the system of claim 17, as described above, wherein the control unit is adapted to adjust the first register; As shown above, the first register is adjusted on a termination.
- b. Levitan in view of Hennessy does not disclose that the first register is adjusted by an amount determined by one of the set of counters. This would consist of forwarding data from the counters instead of retrieveing from the register file or memory.
- c. Nakada has disclosed a method of register bypassing in figure 1a where the needed data is retrieved from its first valid point where it can be selected rather than waiting for it to be written to and then read from the register. Anyone of ordinary skill in the art can se the performance advantage in this. The counters of Levitan in view of Hennessy will hold the correct data for adjustment when a branch has not yet completed. The first register will need this value if a `MOVE_TO_COUNT` has executed in the mean time before the exception. By adjusting the first register by an amount in the counters when possible, rather than waiting for an access to the second register, which is a general purpose register and thus in the register file, valuable time is saved.
- d. This performance increase would have motivated one of ordinary skill in the art to use the register bypassing given by Nakada in the design of Levitan in view of Hennessy to forward data from the counters to the first register.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the design of Levitan in view of Hennessy to include the register bypassing

technique introduced by Nakada for forwarding data from the counters to the register file on an exception in order to decrease recovery time.

43. In regard to claim 19,

- a. Levitan discloses the apparatus as in claim 12, as described above, wherein following a termination of an instruction in the pipeline, the control unit is adapted to adjust the first register where the termination occurred. Column 7, lines 41-46, shows that the adjustment values held in register 46, as shown above, are decremented (by down counter 64 of figure 3) when the BRANCH_ON_COUNT is completed (thus leaving the pipeline and terminating). Because the adjustment happens upon termination, the two functions are synonymously linked and must happen in the same stage where such a branch termination can be detected.
- b. Levitan in view of Hennessy does not disclose that the first register is adjusted by an amount determined by one of the set of counters. This would consist of forwarding data from the counters instead of retrieving from the register file or memory.
- c. Nakada has disclosed a method of register bypassing in figure 1a where the needed data is retrieved from its first valid point where it can be selected rather than waiting for it to be written to and then read from the register. Anyone of ordinary skill in the art can see the performance advantage in this. The counters of Levitan in view of Hennessy will hold the correct data for adjustment when a branch has not yet completed. The first register will need this value if a

MOVE_TO_COUNT has executed in the mean time before the exception. By adjusting the first register by an amount in the counters when possible, rather than waiting for an access to the second register, which is a general purpose register and thus in the register file, valuable time is saved.

d. This performance increase would have motivated one of ordinary skill in the art to use the register bypassing given by Nakada in the design of Levitan in view of Hennessy to forward data from the counters to the first register.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the design of Levitan in view of Hennessy to include the register bypassing technique introduced by Nakada for forwarding data from the counters to the register file on an exception in order to decrease recovery time.

Conclusion

44. The following is text cited from 37 CFR 1.111(c): In amending in reply to a rejection of claims in an application or patent under reexamination, the applicant or patent owner must clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. The applicant or patent owner must also show how the amendments avoid such references or objections.

45. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited to further show the art with respect to conditional execution.

US Pat No 5,561,776 to Popescu discusses speculative execution of branch instructions.

US Pat No 5,592,636 to Popescu discloses speculative execution related to branching and handling traps that may occur.

US Pat No 6,003,128 to Tran discloses a loop prediction method and apparatus using a loop counter and speculation.

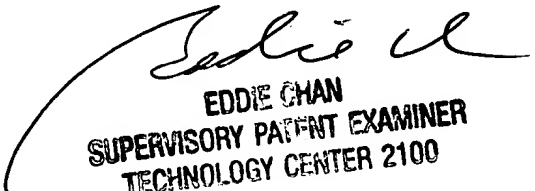
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shane F Gerstl whose telephone number is (703)305-7035. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (703)305-9712. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

Shane F Gerstl
Examiner
Art Unit 2183

SFG
November 12, 2003


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